

placentæ. Only in one case, *Ptychobranchnus*, the placentæ are discharged whole.

Through these holes, of course, the glochidia are emptied into the branchial chamber, and from this they must go out through the branchial opening.

I have directly observed this discharge through the edge of the marsupium in the following species: *Ptychobranchnus phaseolus* (Hildr.) (specimen preserved in alcohol in the act of discharging), *Lampsilis luteola* (Lam.), *Lumpsilis ventricosa* (Barn.), and *Lampsilis multiradiata* (Lea) (seen in life).

I have seen evidence of this discharge, in the shape of openings at the edge of the marsupium, in alcoholic material of *Lampsilis luteola* (Lam.), *Lampsilis multiradiata* (Lea), *Lampsilis nasutu* (Say), *Proptera alata* (Say), *P. gracilis* (Barn.), and *Obovaria circulus* (Lea).

It is very likely that the peculiar morphological structure of the marsupium of the *Lampsilinæ* is directly connected with and due to this "unnatural" discharge of the glochidia, and thus we would be able to correlate the chief morphological differentiation of the *Lampsilinæ* with a physiological differentiation. In the other two subfamilies, *Unionidæ* and *Anodontinæ*, the primitive and natural way of discharge has been preserved.

But also between these latter two subfamilies we have morphological differences which are connected with physiological differentiation: the *Unionidæ* possess the more primitive structure of the marsupium, and they are all "summer breeders," or, to express the characteristic feature, are forms with a short breeding season. The glochidia are here discharged as soon as they are fully developed. In the *Anodontinæ* we observe highly complex structures of the marsupium, which apparently are correlated with the fact that they are "winter breeders," or forms with a long breeding season. Here the glochidia, after being fully developed, are not immediately discharged, but are carried through the winter, and for this purpose special structures are present which serve for the proper aeration of the marsupium during this period.

I publish these observations and conclusions chiefly with a view to induce others to test them by looking for additional cases in other species and genera.

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#### NOTES ON CALIFORNIA SHELLS.

BY W. H. DALL.

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During the past summer I visited the Pacific coast with the object of gathering data on the tertiary and recent mollusk faunas of the

Californian region, and had the good fortune to be able to inspect nearly all the collections in private or public hands, which were of importance for my studies. I propose from time to time to give the readers of the NAUTILUS the benefit of some of my notes made during the past summer.

One of the most esthetically attractive collections on the coast, containing large series of many of the rarer Californian marine shells, is that of Dr. R. H. Tremper at Ontario, Cal. These specimens are mostly from southern California, and comprise besides mollusca a fine series of the beautifully colored brachiopods of the region, *Laqueus californicus*, the attractive crimson-tinted variety (*rubescens*) of *Terebratulina transversa*, the white *Terebratulina kievensis* (also known from Japan) and the gorgeous vermilion-streaked *Terebratulina obsoleta*. Attached by their peduncles to a rock brought up on a fisherman's hook from 60 fathoms off Redondo were the first and last mentioned species, with another which I did not recognize as Californian, and which proved on comparison to be the Japanese *Terebratulina crossei* Davidson, now for the first time reported from the eastern border of the north Pacific. Another shell which seemed particularly attractive, and which was new to me, was a variety of *Lottia gigantea*, which may be called *albomaculata*, offering, instead of the usual brown and grey upper surface, the feature of being spotted with rounded white maculations regularly disposed. A pretty variety (called by Mr. Hemphill var. *Tremperi*) of the fine purple-brown *Murex carpenteri* Dall is decorated with two neat white bands below the periphery. This was obtained by Dr. Tremper in 35 fathoms, off Newport, with many of the typical form.

This collection contains, among other things, a most brilliant series of the *Pecten hastatus* Sowerby in a great number of color varieties and fully the size of the northern *P. hericeus* Gould. On some of these, near the byssal notch, were seated examples of *Capulus californicus*, now for the first time reported as commensal with any species except *P. diegensis*.

I may add to this note that through the intervention of a friend I was able to purchase at Venice a specimen of *Haliotis cracherodii*, which is believed by west coast collectors to be unique. It is a perfectly normal, moderate-sized specimen, probably obtained on the coast of Los Angeles county, rather more elevated than the average, and which has not been cleaned or modified in any way. Its peculiarity consists in the fact that it has never possessed the slightest trace of a perforation, even in the youngest stages, and there is not even a suspicion of a notch at the margin. Other specimens like Hemphill's remarkable variety *holzneri* have been seen with very few perforations (Stearns records one with only two holes and a notch), but these had earlier perforations which had been closed up and were more or less abnormal in other respects. The present specimen differs from all of them in never having had any holes whatever.